Reconocimiento de Patrones

Version 2022-2

Descriptores de Fourier

[Capítulo 2]

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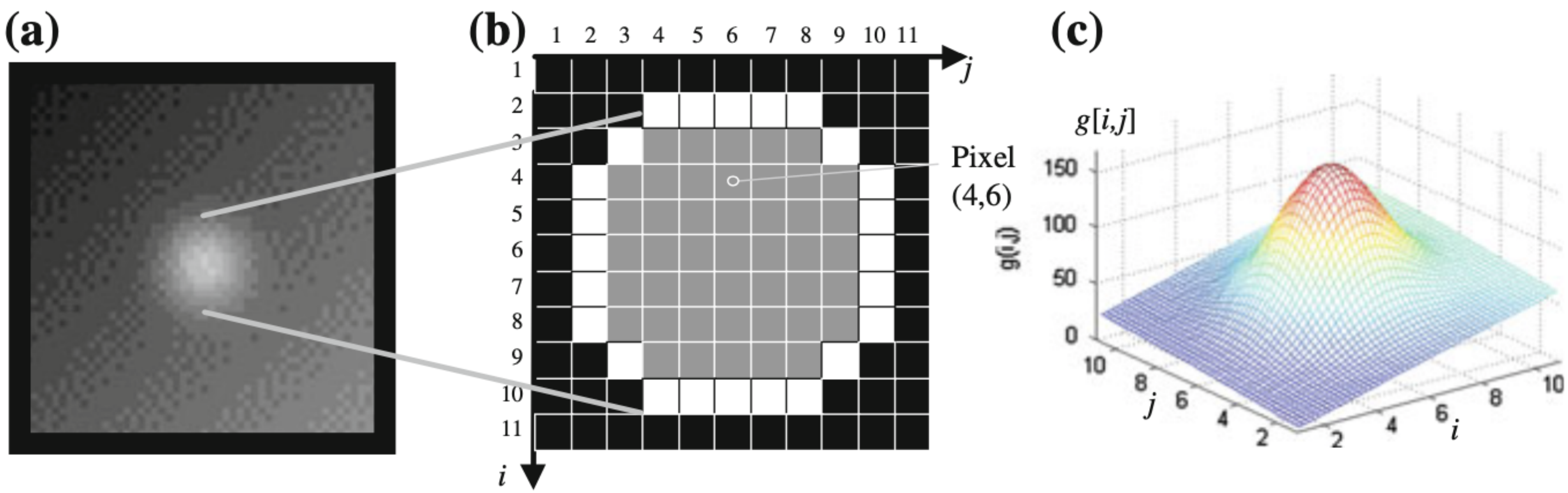


Fig. 5.1 Example of a region: **a** X-ray image, **b** segmented region (*gray* pixels), **c** 3D representation of the gray values

5.2.3 *Fourier Descriptors*

Shape information—invariant to scale, orientation and position—can be measured using *Fourier descriptors* [5–7]. The coordinates of the pixels of the boundary are arranged as a complex number $i_k + j \cdot j_k$, with $j = \sqrt{-1}$ and $k = 0, \ldots, L-1$, where L is the perimeter of the region, and pixel k and $k+1$ are connected. The complex boundary function can be considered as a periodical signal of period L. The Discrete Fourier Transformation [8] gives a characterization of the shape of the region. The Fourier coefficients are defined by:

$$F_n = \sum_{k=0}^{L-1} (i_k + j \cdot j_k) e^{-j\frac{2\pi kn}{L}} \qquad \text{for } n = 0, \ldots, L-1. \tag{5.10}$$

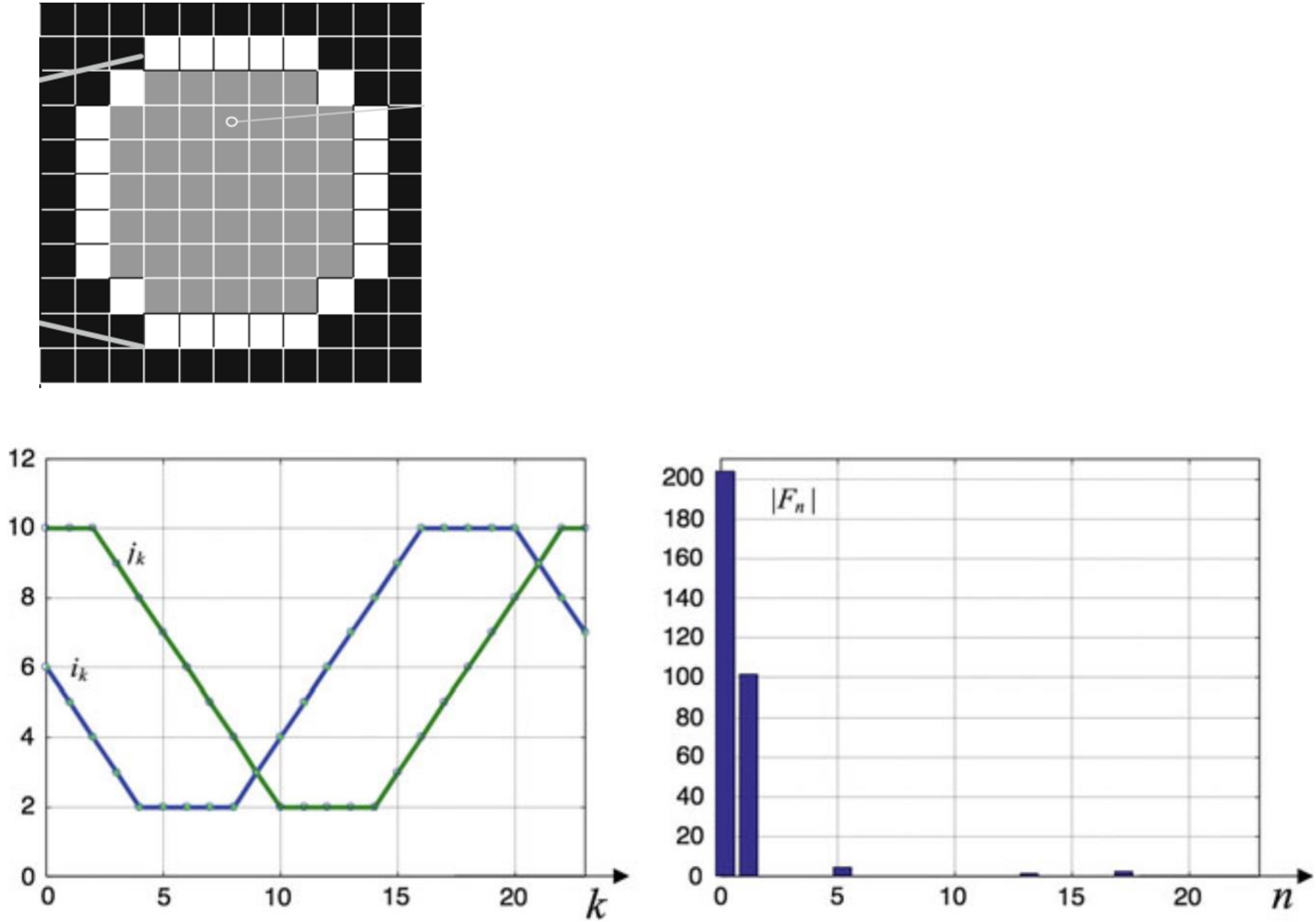
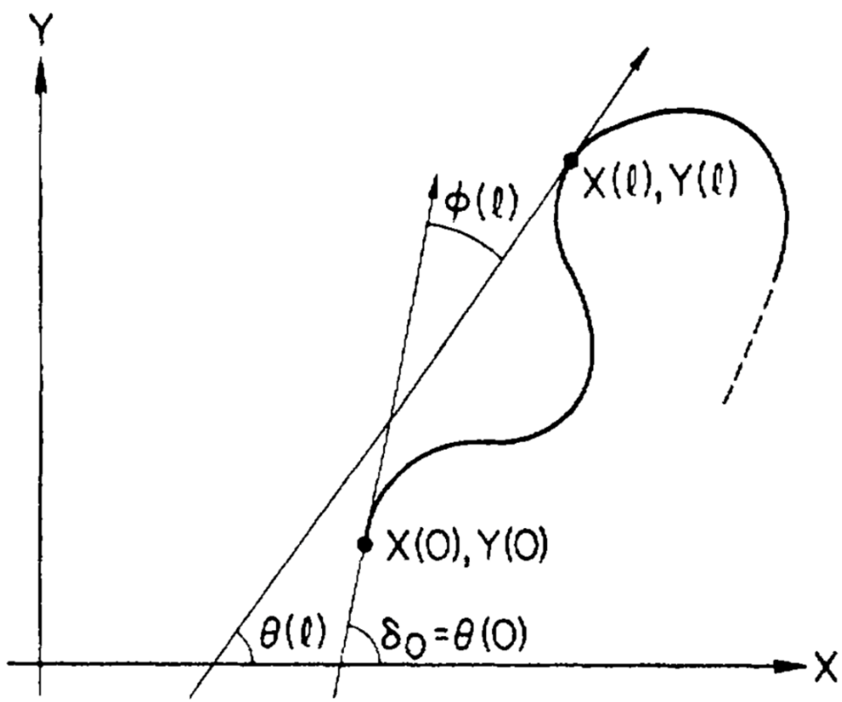
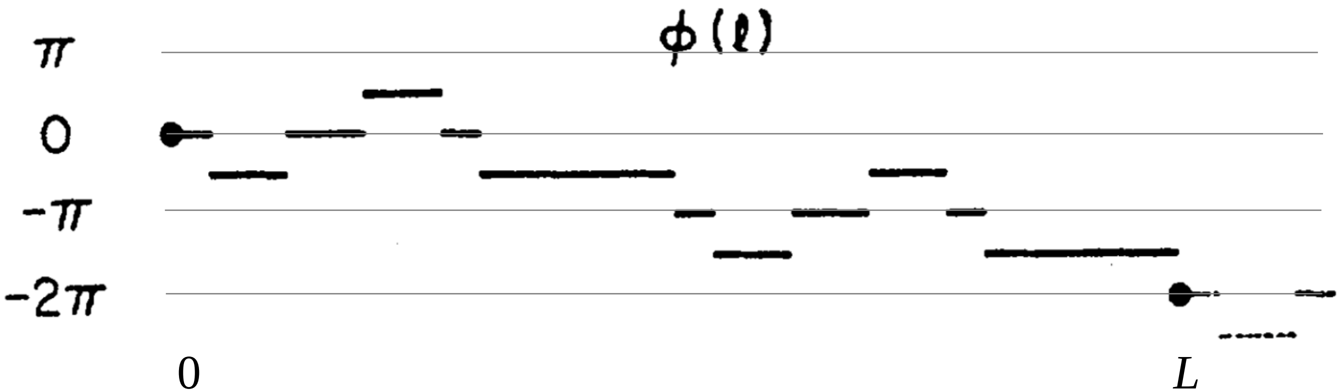


Fig. 5.4 Coordinates of the boundary of region of Fig. 5.1 and the Fourier descriptors

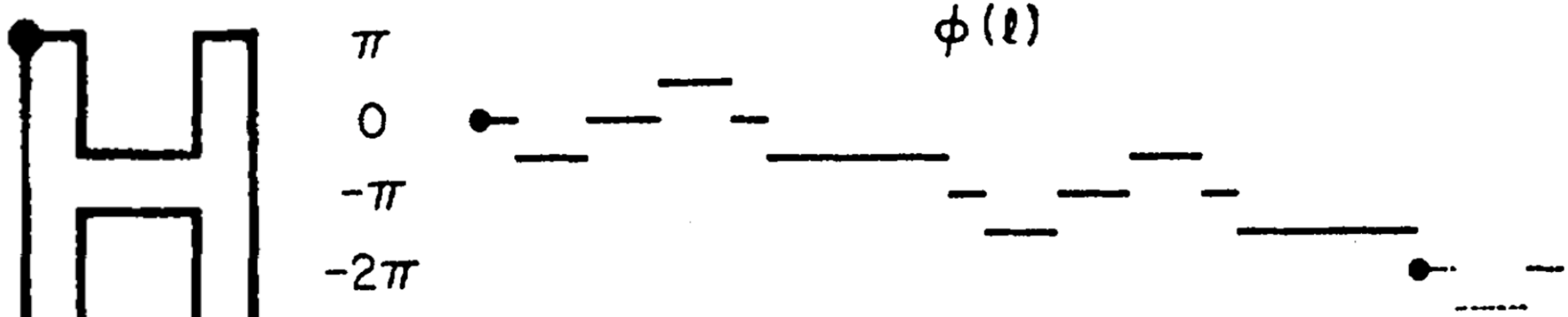
Fourier Descriptors for Plane Closed Curves

CHARLES T. ZAHN AND RALPH Z. ROSKIES



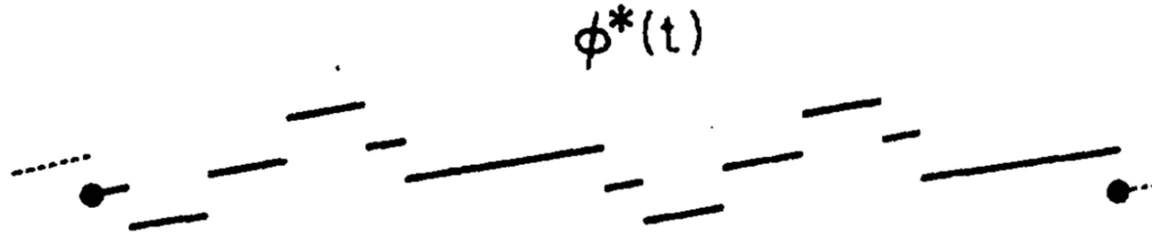


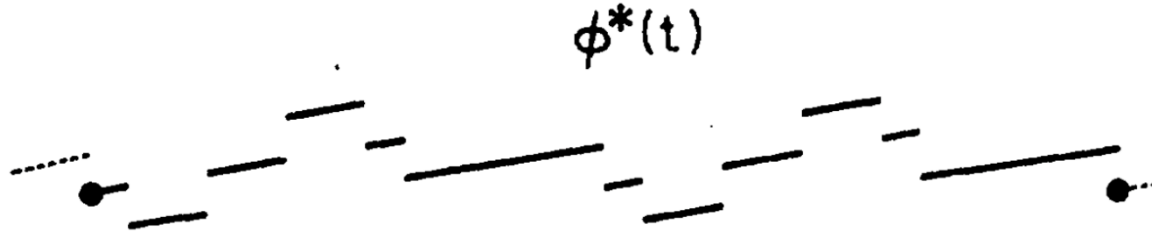
$$\phi(L) = -2\pi$$



$$\phi(L) = -2\pi$$

$$\phi^*(t) = \phi\left(\frac{Lt}{2\pi}\right) + t \qquad t \in [0, 2\pi]$$





$$\phi^*(t) = \phi\left(\frac{Lt}{2\pi}\right) + t$$

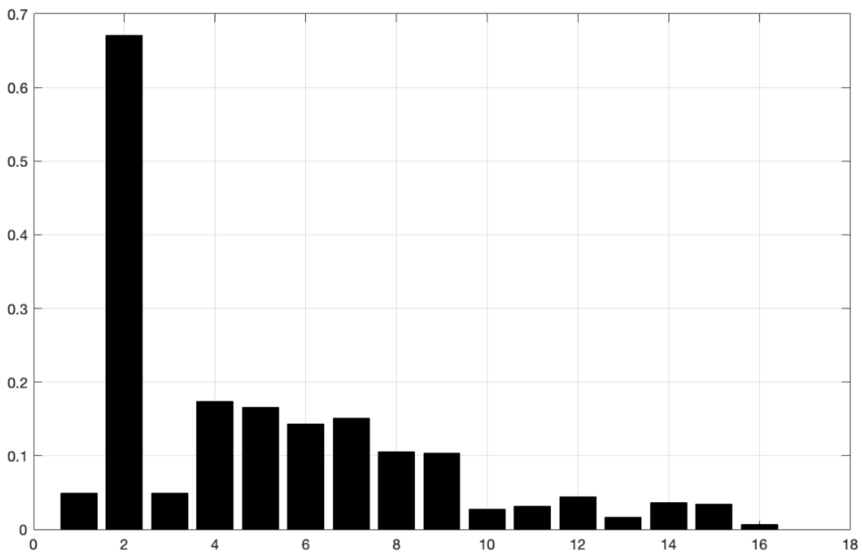
Serie de Fourier

$$\phi^*(t) = \mu_0 + \sum_{k=1}^{\infty} (a_k \cos kt + b_k \sin kt)$$

$$F_k = \sqrt{a_k^2 + b_k^2}$$

Descriptores de Fourier

Ejemplo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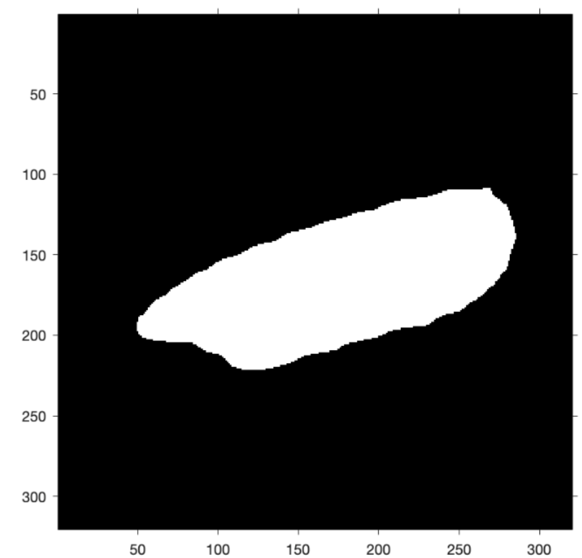
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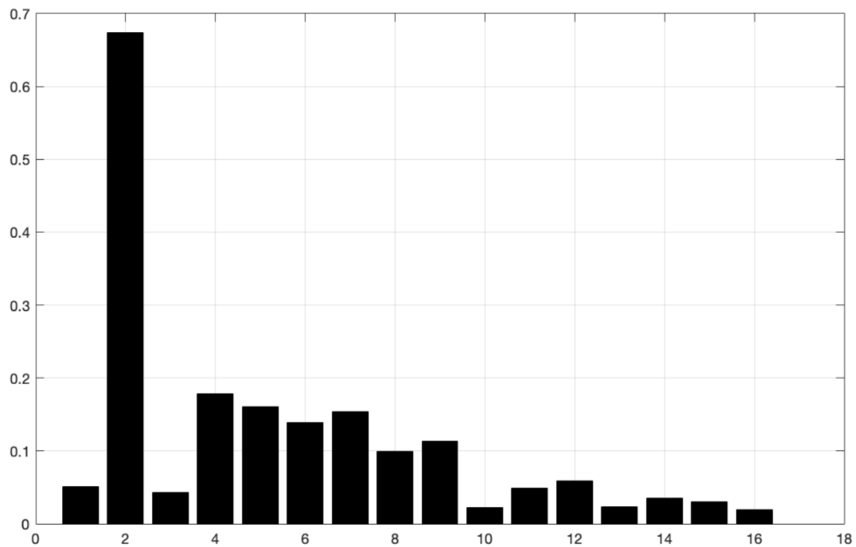
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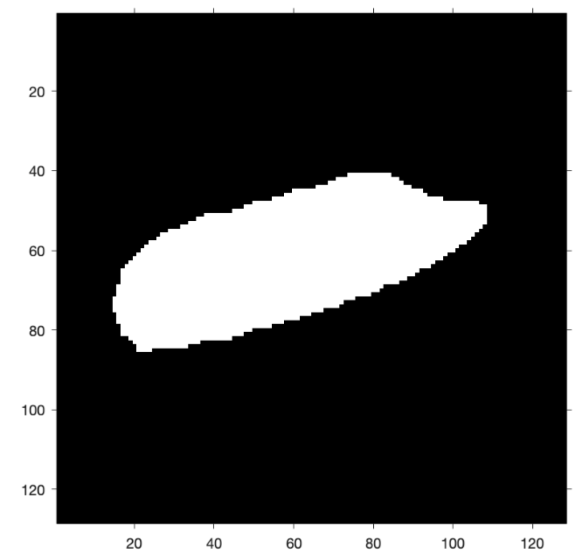
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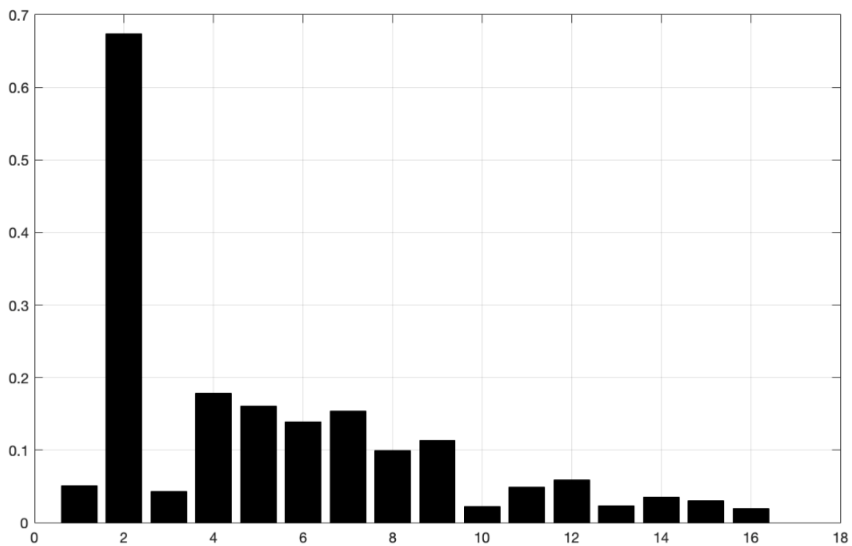
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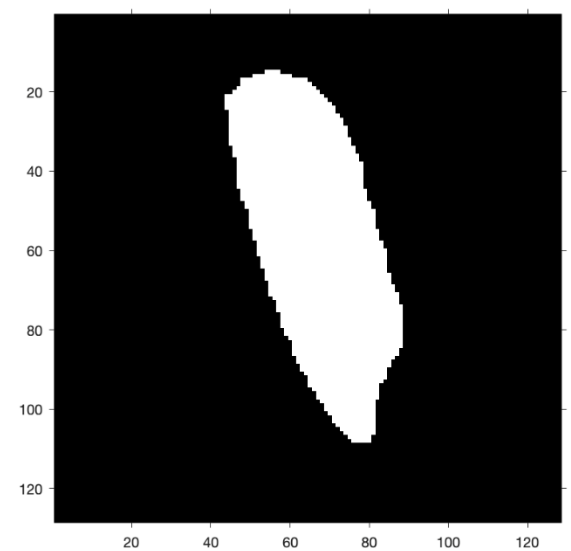
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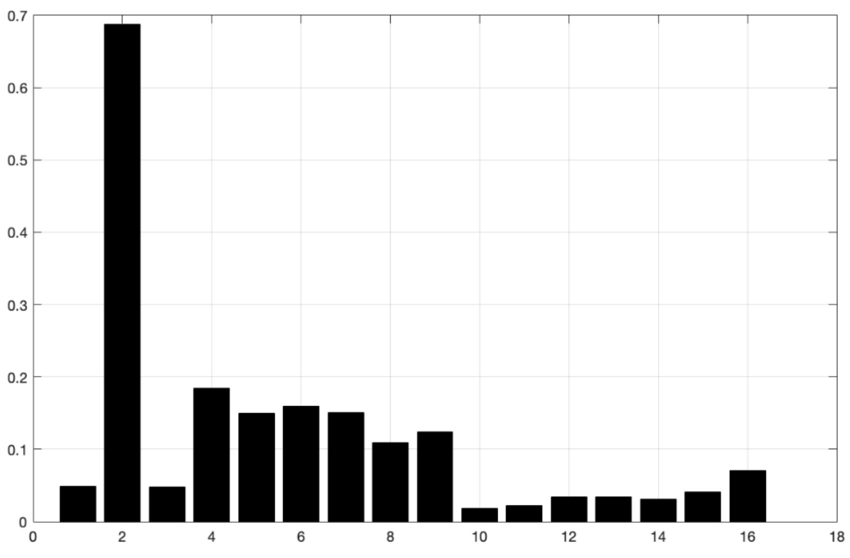
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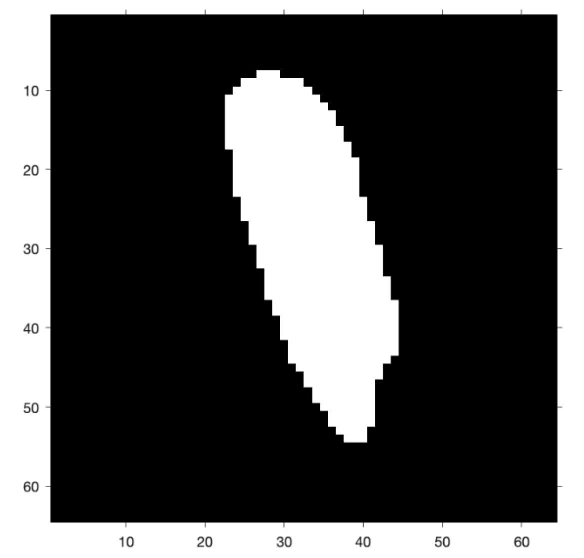
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